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THIRD UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

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Abstract of the national paper of Viet Nam

1. Viet Nam has been involved in remote sensing by satellite since 1979, with the implementation of the United Nations Development Programme (UNDP), the Food and Agriculture Organization of the United Nations (FAO) project VIE/76/014 by the Ministry of Forests and of UNDP/FAO project VIE/76/011 by the National Centre for Scientific Research of Viet Nam, the predecessor of the National Centre for Natural Sciences and Technology.

2. Remote sensing, integrated with the Geographic Information System, has become a necessary tool in many institutions in Viet Nam, including government agencies. Major fields of application are forestry, land use planning, disaster mitigation and the environment. Viet Nam participates in the Regional Space Applications Programme and the regional projects of the Economic and Social Commission for Asia and the Pacific (ESCAP). Other bilateral projects with Canada, France and Japan, and with the European Union have been implemented in recent years.

3. In 1997, a high-resolution meteorological satellite receiving system for geostationary meteorological satellites and the National Oceanic and Atmospheric Administration of the United States of America has been established for daily weather forecasting.

4. Over the past 10 years, Viet Nam Telecommunications has achieved remarkable results in setting up a modern telecommunication network. Telephone density increased from 0.21 per cent in 1991 to 1.65 per cent in February 1997. The Viet Nam Broadcasting and Telecommunication Organization has leased transponders from the International Telecommunications Satellite Organization and the International Organization of Space Communications (INTERSPUTNIK) and other satellites from countries of the region for its communication needs. Viet Nam is interested in having its own satellite for multiple purposes to promote satellite communication applications. The Viet Nam Satellite Launching Project is expected to be completed by the year 2001.

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Abstract of the national paper of Bulgaria

Space activities in Bulgaria from 1982 to 1999

1. During the period 1982-1999, scientific programmes and the relevant equipment for the space flight of the second Bulgarian astronaut were prepared and successfully deployed on board the manned space station Mir. Bulgarian scientists also took part in international projects and programmes such as Vega, Phobos-1 and 2, Interball, Koronas, Aktiven, the Mir space station and Priroda.

2. Space studies concentrated on scientific and applied research in a number of major fields.

1. The Space-Earth system

3. The following main results were obtained in the field of Earth observation (remote sensing):

(a) Instrumentation and complexes such as the multi-channel spectrometer complexes Spectrum-15 (on the Salyut-6 manned orbital station); Spectrum-15M (on the Salyut-7 manned orbital station); SMP-32 (on board the Meteor-Priroda satellite as part of the Bulgaria 1300-II space project)); Spectrum -256 (on the Mir space station); and ISOCH-20 and ISOCH-111; and the R-400 two-polarization scanning radiometer complex (on board the "Priroda module docked with Mir) were designed to carry out remote sensing of Earth and the planets;

(b) New results concerning the interaction of incidental radiation with different natural formations, their status and the irradiance and spectral reflectance structure were obtained. Formulas for spectral reflectance coefficients, spectral reflectance characteristics, reflectance indices, vegetation coefficients and colour coordinates of mixed spectral classes of natural formation were obtained, including the general case of N classes. The theoretical statistical distributions of the most frequently used vegetation coefficients were also obtained;

(c) Techniques and instrumentation for the study of the impact of heavy metals, high fertilization, water and herbicide stress, ultraviolet radiation and drought on soil and vegetation were developed and implemented;

(d) Bulgarian scientists participated fruitfully in the following United Nations and European Union projects: Coordination of Information on the Environment (CORINE) Land Cover and MARS and Environmental Related Applications (MERA). Results were obtained

by means of interpretation of space images for purposes of agriculture, geology, hydrology, study of global change and so on;

(e) Bulgarian scientists took part in the Phobos scientific project to examine the surface of Mars and Phobos: the Fregat video spectrometer and navigational complex was designed under the leadership of Bulgarian scientists, together with scientists of Germany and the Russian Federation; data acquisition, processing and interpretation of the multi-channel images was performed together with scientists of Finland, France, Germany, the Russian Federation and the United States of America; the results have been published in *Nature*, *Planetary and Space Science* and other journals.

4. As regards the use of satellite data in weather forecasting, after the beginning of the reception of data from Meteosat in Bulgaria in 1987, the priorities of satellite meteorology research were directed mostly to the use of Meteosat data in weather forecasting over the Mediterranean. Over the last years, the scientific research in this field has focused on the use of Meteosat data in the 6.3 μm water vapour channel for analysis and forecasting of different types of Mediterranean cyclone that affect the weather over the Balkans. As a result, indicators of water vapour images that are informative about the evolution of such cyclonic systems have been obtained.

5. Another field of space research was the qualitative and quantitative relationship between Meteosat data and the potential vorticity (PV) field. The correlation of Meteosat data to the high values of PV (PV anomalies) associated with cyclonic developments in the middle of the troposphere was studied.

6. The latitudinal effects on the relationship between water vapour channel data and the PV at 500 hPa have also been studied. Linear regression models were fitted to the samples from a Mediterranean case study in the northern (35°-55° N) and southern (25°-35° N) belts. Finally the potential for validating numerical weather prediction output by comparing WV imagery with PV fields has begun to be studied.

2. Space physics

7. The scientific instrumentation for the Council on International Cooperation in the Study and Utilization of Outer Space (INTERCOSMOS)/Bulgaria-1300-1 satellite was developed and launched successfully in 1981. The scientific programme for it was directed at magnetosphere-thermosphere-ionosphere interactions on a planetary scale. Fluxes of charged particles, magnetic and electric fields and currents, electron and ion densities, plasma waves and irregularities, electron, ion and neutron temperatures and so on were measured on board and analysed during both calm and turbulent periods in solar-terrestrial relationships.

8. As regards theoretical research, in magnetosphere physics a study was carried out on field-aligned currents in extraterrestrial space, relating to both the magnetosphere and the ionosphere. Studies in the field of ionosphere physics were conducted in the following areas:

(a) Upper ionosphere: creation of prediction methods for critical frequencies of the F-region;

(b) Middle and lower ionosphere: development of models of the interaction between cosmic rays and high-energy particles, the D- and E-regions and the middle atmosphere;

(c) Irregularities in the ionosphere and their dynamics;

(d) Investigation of periods of particular solar activity, with proton flares and coronal mass ejection events associated with geomagnetic and ionosphere storms. Here parallel data from the INTERCOSMOS Bulgaria-1300, Dynamics Explorer - 1 and 2 and Arcad satellites were used. In physics of the middle atmosphere (strato-mesosphere) research centred on the

behaviour of the minor constituents in the middle atmosphere, ozone, carbonic oxide and others, which are of ecological importance.

9. Scientists from the Bulgarian Academy of Sciences, together with scientists from the Institute for Medical and Biological Problems in Moscow and the Belgian Institute for Space Acronomy, conducted a long-term investigation of the radiation environment of the Mir space station with the Bulgarian-Russian active space dosimeter complex Liulin. An empirical model was built and can be used for prediction of the expected doses and fluxes on the orbit of the International Space Station.

3. Satellite communications

10. The existing system for space communications based on board satellites of the Statzionar type at 14° W was developed further. A five-year research project under Bulgarian climatic conditions was carried out by means of specially designed relay systems in order to estimate the impact of the radio wavelength propagation in the range of frequencies greater than 10 GHz. Satellite transmitters working in the 11, 20 and 30 GHz bands were designed and launched on board a satellite in order to study the propagation of wavelengths in those frequency ranges. The ground-based receiver of the International Telecommunications Satellite Organization was established, working in the frequency range 5.9-6.4 GHz. The emission of Bulgarian National Television's "TV-Bulgaria" programme started through the European Telecommunications Satellite Organization satellite at 13° E.

4. Space life sciences

11. Research was carried out on the following topics in the field of space medicine and biology:

(a) The impact of immobilization on the central nervous system and the general functional state of the human organism;

(b) The status of the muscle system in space conditions;

(c) How factors such as age and professional training affect reaction to high-load conditions;

(d) Psychological reactions of astronauts to microgravity conditions and peculiarities of the wake-sleep cycle. Bulgarian devices and systems for psychodiagnostics in space conditions were designed, developed and successfully used.

12. New types of space foods have been created and technologies for their production have been developed.

13. Improved Svet greenhouse models were tested on board Mir together with Russian and United States astronauts, and the first plants were grown within one vegetation cycle.

14. Scientists from the Bulgarian Academy of Sciences are now working on the development, testing and calibration of a new-generation active space dosimeter complex of the Liulin-4 type. It consists of four mobile dosimetry units and one control and interface unit. The system's main purpose is to monitor simultaneously the doses and fluxes at four independent places on the United States Laboratory module of the International Space Station. The system is scheduled for launching during the first half of 2000.

15. The Neurolab system for psycho-physiological measurements was tested in space conditions.

5. Satellite techniques and technologies

16. It is a characteristic of the Bulgarian space programme that implementation has been completed not only of complex devices and systems for space research, but also of space technologies for new materials and products developed by Bulgarian scientists. Analysis and application of multi-channel data and images were also implemented. This refers first of all to the complex scientific techniques and equipment developed for the space flights of the first and second Bulgarian astronauts, the satellites included in the Bulgaria-1300 space project and the Bulgarian scientific space complexes in the framework of the Vega, Interball, Phobos, Priroda and other international missions.

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Abstract of the national paper of Mexico

I. General

1. Mexico uses space technology for peaceful purposes as part of its strategy to promote national development. The main applications of this technology are to be found in the following fields: air and marine navigation, telecommunications, economic and social development, national capacity-building in formulating strategies geared to sustainable development and in solving problems in the fields of health and education, in the environmental sphere and in the areas of prevention and disaster relief.

2. With regard to space laws and regulations, Mexico believes that the strengthening of the legal regime governing outer space under equitable conditions constitutes for all States a further guarantee of the peaceful uses of outer space. It has accordingly supported bilateral and multilateral efforts and made significant strides in adapting its domestic legislation to the development of new applications and activities in the utilization of space resources. For Mexico, cooperation in science and technology represents a key tool in ensuring for States the most balanced access to technologies that will enable them to make effective use and maximize the benefits of space resources. Mexico thus considers that the promotion of knowledge of outer space and its technological applications should be encouraged both nationally and internationally, as part of the cultural heritage of present and future generations, fostering a comprehensive and integrated vision of the environment and a greater awareness of the potential uses of this resource and the need to preserve it.

II. Satellite development

3. Using the features of the geostationary orbit, Mexico has since 1985 placed in orbit six satellites belonging to three generations: (a) first generation: Morelos I (113.5° W; date of launch: June 1985; end of life: March 1994) and Morelos II (116.8° W; date of launch: November 1985; still in inclined orbit); (b) second generation: Solidaridad I (109.2° W; date of launch: November 1993; end of life: 2007), Solidaridad II (113.0° W; date of launch: October 1994; end of life: 2008) and the placing in Earth orbit of the UNAMSAT-B satellite from the Plesetsk launch site in Moscow by the Autonomous National University of Mexico (UNAM) on 5 September 1996; and (c) third generation: Satmex 5 (116.8°; date of launch: December 1998; end of life: 2013).

III. Space activities

4. In November 1985, a Mexican astronaut took part in a space mission for the first time during the mission to place the Morelos II satellite in orbit. On that occasion, various experiments designed by Mexican scientists were also carried out.

IV. Use of telecommunications in health care

A. Education for health: managerial training and continuing education

5. The Ministry of Public Education (SEP), the National Polytechnic Institute (IPN) and UNAM are collaborating in the development of the managerial, academic and social subprogrammes in the areas of technology, legislation, finance and health education.

B. Telemedicine

6. Mexico has established a national telemedicine programme as one of the applications of telecommunications and information technology in the field of education. This programme is designed to promote the exchange of knowledge between the more standard and the highly specialized units with a view to expanding the coverage of the services and enhancing their response capability and to making effective use of the resources allocated to the health services. As a world pioneer in telemedicine, our Government has been sharing its experience with France, Costa Rica and other countries.

7. The telemedicine programme was initiated in 1994, in Mexico City, at the 20 de noviembre National Medical Centre within the Institute of Social Security and Services for State Employees (ISSSTE). This programme, which came into operation in 1996, is aimed at developing a series of strategies and actions for the purpose of implementing the computerized interconnection system for the transmission and reception of data on medical treatment, teaching and administration by satellite or fibre-optic links.

V. Distance education programme

8. The distance education programme, which is operated on the Educational Television Satellite (Edusat) network of the Mexican Government was introduced in December 1995 with the aim of increasing the contribution of the communication and information media to efforts to bridge the educational gap and to expand the coverage and improve the quality of education. In order to achieve wider cover across the continent, the Edusat network uses the Solidaridad I and Satmex 5 satellites to link up with public and cable television, microwave, telephony and radio broadcasting systems.

9. The Edusat programme range, which is transmitted through eight channels, comprises cultural, social, scientific and educational topics designed to increase the knowledge of its viewers and provide them with entertainment. In Mexico, the Edusat network has 24,000 signal receivers installed at various educational centres, covering pre-school, primary, lower and upper secondary, technical, vocational, further, adult and continuing education and in-service training, for the benefit of children, young persons, parents and teaching staff.

VI. Outer space law

10. In 1996, the delegation of Mexico submitted to the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space a proposal for a review of the status of the

five international legal instruments governing outer space, with the aim of promoting the universality of outer space law through the implementation of appropriate measures to achieve greater accession by States to the international conventions in force. In 1997, following extensive consultations between Member States, the Legal Subcommittee included that proposal as a new item on its agenda.

VII. Regional centre for space science and technology education in Latin America and the Caribbean

11. On 18 August 1998, the *Official Gazette of the Federation* published the decree promulgating the agreement between the Governments of Mexico and Brazil concerning the establishment of a regional centre for space science and technology education in Latin America and the Caribbean.

12. Mexico is currently undertaking an analysis with a view to completing the requirements that will enable the centre to become fully operational in our country.